

## 2.0 DESCRIPTION OF PROPOSED PROJECT

This section of the *Analysis of Impacts to Public Trust Resources and Values* (APTR) document prepared by the California State Lands Commission (CSLC) describes the history and details of the proposed Broad Beach Restoration Project (Project). Section 2.1 presents the Project site history and an overview of previous efforts to address beach erosion, damage to structures, and potential damage to private sewage disposal systems. Section 2.2 provides a detailed description of the components of the proposed Project ("Project"), and Section 2.3 describes construction activities associated with the Project.

### 2.1 PROJECT BACKGROUND

#### 2.1.1 Project History

##### Historical Conditions of Broad Beach

Development along Broad Beach began in the 1930s, consisting of small beach cottages. Given the area's rural character and limited infrastructure available at that time, septic systems and leach fields were typically installed in or close to the sand dunes to the seaward side of the residences. In addition, at least two public drainage culverts were installed through the dunes to carry local storm water runoff to the Pacific Ocean. Those drainage pipes and most leach fields remain intact and operative. Broad Beach remained a relatively wide beach over the ensuing years, especially through the early 1970s. Residential development continued and most lots were developed by the late 1980s. Currently, 114 residences occupy 122 lots bordering the Beach and adjacent dunes, with 5 lots currently vacant and 3 residences occupying double lots.

The width of Broad Beach reached a peak in 1970 at a yearly average of 60 feet landward of the mean high tide line (MHTL), but the beach has been receding since



*Western reach of Broad Beach, 1972*



*Western reach of Broad Beach, 2010*

*Recent analyses (Everts Coastal 2010, Coastal Frontiers 2011) indicate that Broad Beach has been subject to considerable sand loss over the last 40 years, while new home construction during this period has exposed many more structures to damage and erosion hazards (Photos: California Coastal Records Project 2011).*

then. Between 1974 and 2009, approximately 600,000 cubic yards (cy) of sand were lost at Broad Beach, a majority of which moved east to nourish Zuma Beach and other locations down coast (Everts Coastal 2009). The shoreline moved inland an average of 65 feet during that time period. The area of greatest beach erosion occurred close to Lechuza Point and tapered off toward Trancas Creek. Since the beach started to recede around 1974, the Broad Beach sand loss rate has accelerated to approximately 35,000 cy per year during the 2004-2009 time period (Everts Coastal 2009).

### Coastal Protection and Public Access Issues

Partially as a result of this accelerated coastal erosion and influenced by increased new home development, requests from area homeowners for coastal protection structures increased along Broad Beach, and issues have arisen regarding coastal access, private property rights, and the scope of the public's right to lateral access on the beach. As the beach narrowed over the years since 1974, Broad Beach homeowners, particularly those along the central and western portions of the beach, installed approximately 21 individual coastal protection structures, including vertical timber piling and concrete seawalls, caissons or pilings and rock revetments.



*Wave action in the 1997-1998 El Niño led to major structural damage to one home on Broad Beach (Source: Norton Karno, February 1998).*

The 1997-1998 El Niño storm seasons caused considerable shoreline erosion and related storm wave damage along the California coastline. Many Broad Beach homes were threatened, causing some homeowners to construct temporary sandbag revetments to protect residential structures and leach fields. One residence suffered major structural damage.

The 2007-2008 winter season, though milder than the 1997-1998 winter, also caused significant coastal erosion at Broad Beach. Many homeowners responded with the placement of disparate and temporary geotextile or sandbag revetments authorized by emergency coastal development permits (CDPs) issued by the city of Malibu; others installed these features without authorization. However, the sand and geotextile bags proved inadequate for reliable shore protection, failed in some instances, and generated debris and litter on the beach.

In addition to increasing coastal protection issues related to erosion, members of the public and area homeowners have experienced on-going conflict over use of the beach and the boundary between public lands (defined as beach areas seaward of the



*Geotextile bags were installed in winter 2008-2009 to protect homes and septic systems from imminent threat of coastal erosion. Some received emergency permits but others appear to be unauthorized.*



*Winter storms in 2008-2009 raised concerns that the geotextile bags were inadequate as protection, collapsing under storm-generated surf and exposing homes to erosion hazards.*

ordinary high water mark [OHWM], see Section 2.1.2 below) and private property along this popular beach. Uncertainties over the location of public beach versus private property and resultant conflicts are further complicated by inconsistent lateral access easements recorded over many years against individual properties along Broad Beach. These easements can be characterized as follows (for more information, see the California Coastal Commission [CCC] report depicting existing lateral access easements [CCC 2004]).

- The easements allow 'public access and passive recreational use along the shoreline' at the affected properties.
- Only about half the homes along Broad Beach have dedicated lateral access easements, and those vary in size and description (refer to Section 2.1.3 below).
- Most of the dedicated public lateral access easements are referenced to the location of the daily high water line or the mean high tide line.

Because of these inconsistent and variable reference points, no easily definable way exists for the public or homeowners to see or even estimate the location of the lateral access easements at any given time. This uncertainty, coupled with the narrowing of the beach, has led to conflicts over the areas open to public lateral beach access or use and areas under private ownership, especially at times of higher tides when the beach is otherwise impassable.

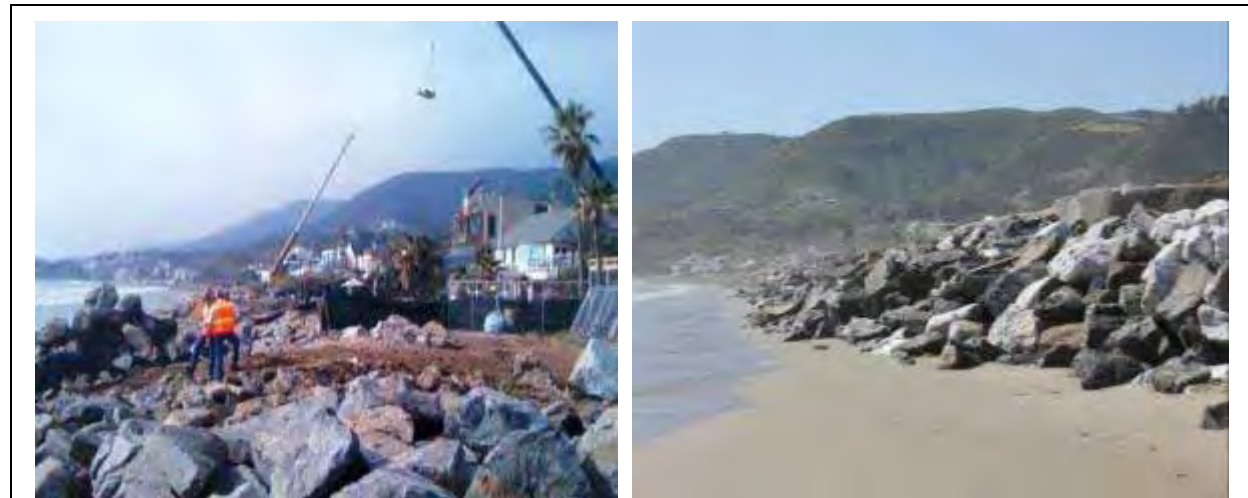
### Construction of Emergency Revetment (2010)

High erosion rates during the 2009-2010 winter season and widespread failure of then-existing temporary emergency sandbag revetments led the local Trancas Property

1 Owners Association (TPOA) to apply to the city of Malibu and the CCC for permits to  
2 construct a temporary emergency rock revetment. This revetment was accepted as the  
3 minimum action necessary, and the least environmentally damaging alternative, to  
4 implement the interim shore protection required to protect structures and public health.  
5 Specific elements of the temporary rock revetment include:

- 6 • Filter fabric to eliminate loss of dune material through voids in the stone matrix;
- 7 • Reduced armor size (1/2 to 2 ton) stone to allow for faster construction; and
- 8 • Shallow toe elevation for improved constructability.

9 In total, approximately 36,000 tons of rock was placed along 4,100 feet of Broad Beach  
10 in front of homes located between 30760 and 31346 Broad Beach Road. The rock was  
11 placed on top of a filter fabric layer and the revetment varies in width from 27 to 41 feet  
12 with an average width of approximately 31 feet at its base. The revetment rises 13 to 17  
13 feet above the average low tide elevation (mean lower low water, or MLLW), with an  
14 average height of 15 feet.



*The existing emergency revetment completed in April of 2010 consists of boulders ranging from 0.5 to 2 tons in size. It was constructed to protect homes and private septic systems and leach fields. The 4,100-foot-long emergency revetment rises approximately 13 to 17 feet above the low tide beach and is 27 to 41 feet wide at its base.*

15 Permitted separately by the CCC and city of Malibu, and other public agencies, homes  
16 between 31302 and 31346 Broad Beach Road received a more robust rock revetment  
17 design and larger rock (up to 4 tons per rock). The property owner at 30822 Broad  
18 Beach Road opted to not participate in the revetment project, which resulted in a more  
19 than 100-foot-long break in the continuity of the revetment in front of this property. This  
20 homeowner has since expressed his desire to fill the gap in the revetment, and is  
21 expected to apply for the permits required to do so. The project also involved  
22 redesigning and rebuilding the two current vertical public access ways, owned and  
23 maintained by the Los Angeles County Department of Beaches and Harbors, from the

street to the beach. The rebuilt access areas include stairways and handrails which traverse over the revetment itself to provide vertical public access to the shore.

Construction of the emergency revetment required the following permits:

- City of Malibu: Emergency CDP No. 09-021; Engineering Permit No. 10-002
- California Coastal Commission: Emergency CDP No. 4-10-003-G
- U.S. Army Corps of Engineers: Clean Water Act Sections 10 and 404 Permit File No. SPL-2009-00979-PHT
- California Regional Water Quality Control Board (LA Region): Clean Water Act Section 401 Water Quality Certification No. 10-003
- Los Angeles County Department of Beaches and Harbors: Permit Nos.: RE-043-09; RE-029-10
- California Department of Transportation (Caltrans): Encroachment Permit No. 710-6TK-0146

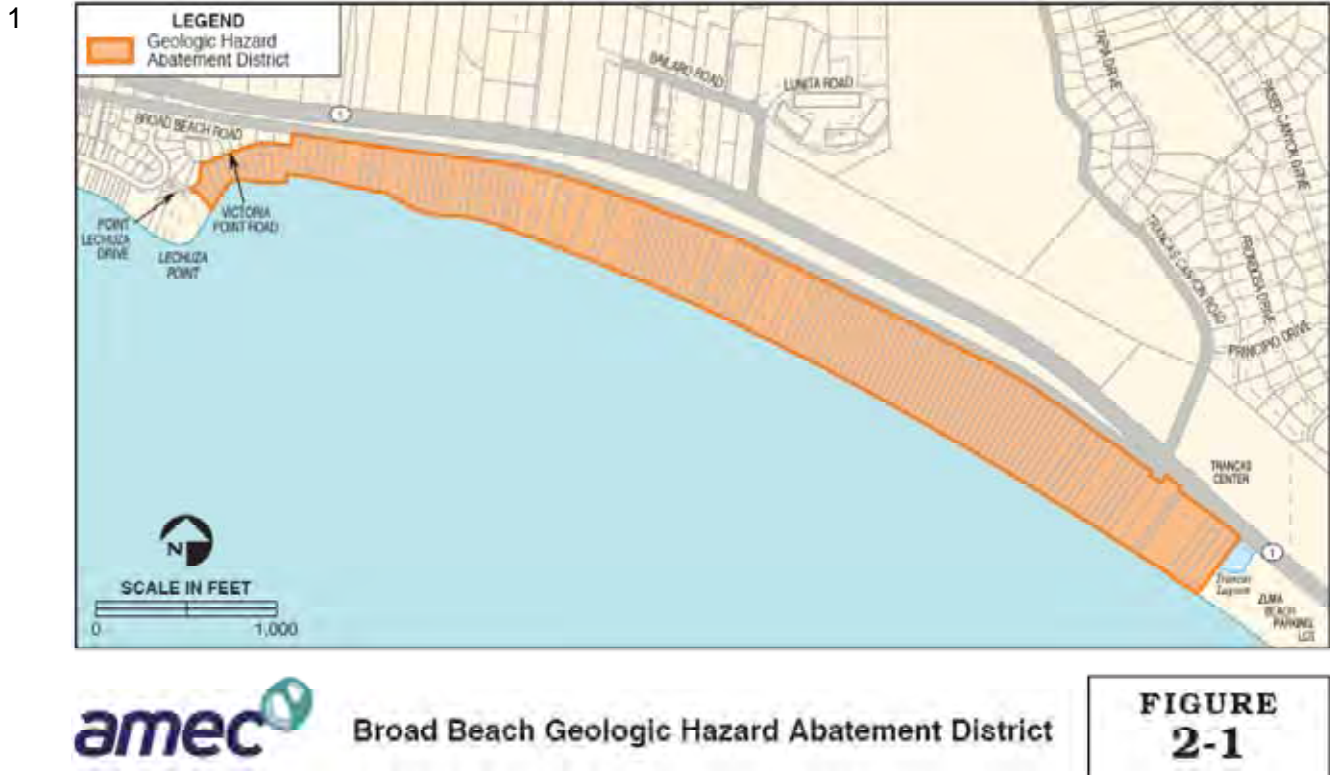
This revetment has been constructed under emergency permits and as such is subject to final permitting by the existing agencies. For the purposes of this APTR document, the CSLC will be considering the location of this revetment in relation to public trust lands and public trust resources. Refer to Section 1.3 for a detailed description of the Public Trust Doctrine and public trust lands and resources.

#### Formation of the Geologic Hazard Abatement District (2011)

Geologic Hazard Abatement Districts (GHADs) are political subdivisions of the state and are formed pursuant to Public Resources Code section 26525 in specific geographic areas to address potential geologic hazards. The purpose of a GHAD is to prevent, mitigate, abate or control defined geologic hazards through maintenance, improvements, or other means. Approximately 50 GHADs exist in California (some are inactive) with approximately four of these formed to address coastal erosion issues.

The city of Malibu approved the formation of a GHAD for Broad Beach and appointed an initial Board of Directors on September 12, 2011. The Broad Beach GHAD spans the entirety of Broad Beach and a portion of Victoria Point, starting at 30708 Broad Beach Road in the east and concluding at 6525 Point Lechuza Road in the west (Figure 2-1).

Financing of a GHAD is accomplished through an assessment of only those property owners who own real estate within the boundaries of the designated district. Issuing and servicing of bonds, notes, or other debentures is also authorized under GHAD law. The assessments and associated financing of GHAD improvements will be overseen entirely by the GHAD Board of Directors. The Broad Beach GHAD Board has approved and passed a resolution (Resolution No. 2011/03) accepting the Plan of Control, which



2 serves as the guiding document for the GHAD.<sup>1</sup> The Plan of Control describes the  
 3 current geologic hazards, and presents a plan for the prevention, mitigation, abatement,  
 4 and control of the hazards. Assessments are calculated based upon the amount of  
 5 linear frontage along the beach of each property located within the GHAD. The property  
 6 owners within the GHAD held an assessment election from late January through March  
 7 2012, and the legally required majority of property owners within the GHAD voted to  
 8 approve the assessment to fund the Project (Resolution Nos. 2012/03 and 2012/04). As  
 9 part of implementing the assessment, the GHAD has also adopted the Engineer's  
 10 Report for the project (Resolution No. 2011/05). GHAD projects are subject to review by  
 11 all required regulatory agencies, including, but not limited to, the CCC, the CSLC and  
 12 the city of Malibu.

### 13 2.1.2 Current Conditions at Broad Beach

14 At most tides, Broad Beach is a narrow ribbon of primarily wet-sand beach that extends  
 15 for approximately 6,700 feet from the Trancas Creek Lagoon on the east (bordering  
 16 public Zuma Beach) to Lechuza Point on the west. The beach is often wider with larger  
 17 pockets of dry sand on the east and narrows to become more of a low-tide beach to the  
 18 west. The beach becomes increasingly rocky in the west in the sheltered cove inside of  
 19 Lechuza Point, where rocky intertidal habitat is mixed with intermittent sandy beach. Of

<sup>1</sup> Section 26509 of the Public Resources Code specifies the Plan of Control requirements.

the 114 residences that border the beach and adjacent sand dunes, 79 are located landward of the existing emergency revetment, while the remaining 35, located at the east and west end, are located outside the emergency revetment's footprint. Residences toward the west end of the beach often have individual seawalls or rock revetments while those at the east end rely on dunes and geotextile sandbag revetments. The beach is accessible to residents and the public primarily at low to moderate tides, but is inundated at medium to high tide.<sup>2</sup> Also located adjacent to the project area is the Malibu West Swim Club, a private recreational club providing beach amenities to several hundred inland residences and hosting church services and social functions.

### 2.1.3 State Sovereign Lands and Private Property Boundary

The location of the boundary between private properties along the California coast and the sovereign lands of the state of California is the ambulatory OHWM, which is generally measured by the mean high tide line (MHTL), except where there has been fill or artificial accretions, or where the boundary has been fixed by agreement or court decision. MHTL surveys do not create a permanent boundary line, but serve as evidence of a MHTL location at that single point in time. The location of the MHTL at any given point in time is a long-term average of shoreline position, but can be affected by sand movement along the coast, variations in long-term wave and storm activity, coastal erosion, rising sea levels over the long term, and the introduction of artificial influences. In the absence of a boundary line agreement with the CSLC or an adjudicated boundary line, the boundary between sovereign land and privately held uplands remains undetermined.

Although the installation of the emergency revetment and the beach renourishment activities proposed by this Project has moved and will artificially push the MHTL waterward, the boundary between state sovereign lands and private uplands will remain at the OHWM. Existing legislation and various court decisions also provide guidance on the presumed location of the MHTL, but many variables can complicate fixing its location. In summary, definition of this line is not clear and may not be evident to beachgoers; its location is often required to be demarcated by surveys and is often subject to adjudication.

<sup>2</sup> During field work on September 14, 2011, during a +5 foot high tide, virtually all of Broad Beach excepting the easternmost 100 yards was observed to be submerged.

Several definitions of the MHTL have been established through the courts, legislation or have been adopted by regulatory agencies. However, the U.S. Supreme Court, using language from the U.S. Coast and Geodetic Survey, provides a definition for the MHTL as follows:<sup>3</sup>

*“Mean high water at any place is the average height of all the high waters at that place over a considerable period of time...from theoretical considerations of an astronomical character”...there should be a “periodic variation in the rise of water above sea level having a period of 18.6 years.” (Borax Consol., Ltd. v. Los Angeles [1935] 296 U.S. 10, 26-27.)*



*Broad Beach currently has a narrow “low tide beach” backed by the existing emergency revetment and single-family homes. In the east-central section of the beach, homes are set back from the beach and revetment and are backed by a steep coastal bluff. Broad Beach Road, which provides direct access to most of the homes, is located at the toe of the bluff and Pacific Coast Highway runs along the top of the bluff. Most of the septic system leach fields are located in the remnant dunes between the homes and revetment. Historically, each home had its own coastal access path across the dunes; currently informal access down the revetment is often shared.*

*(Photo: California Coastal Records Project 2011.)*

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<sup>3</sup> While the question before the court in *Borax Consol., Ltd. v. Los Angeles* (1935) 296 U.S. 10, 26-27 (*Borax*) was the interpretation of “the line of mean high tide,” as used in the grant by the state to the city, both appellate Courts that reviewed the case used the word “mean” interchangeably with “ordinary.” The court in the *Borax* case referred to another case, *Attorney-General v. Chambers*, where the word “ordinary” as applied to tides was considered and defined. Whereas courts often use the terms OHWM and MHTL or “mean high-water mark” interchangeably, the distinction is only relevant in cases where there has been an artificial influence on the beach.

The location of the OHWM at Broad Beach is important to both the public and private property owners as it (1) defines the boundary between public and private lands along the beach front, (2) potentially affects the long-term location of the emergency revetment, and (3) is a key element affecting the public's right to beach access along the shoreline.

The Applicant's engineers conducted two MHTL surveys in 2009, one on October 2 and a second on October 15. This first survey resulted in a depiction of the MHTL that was generally located seaward from the toe of the emergency revetment. This initially identified location was determined by the Applicant's engineers to be potentially inaccurate, so a second survey was conducted. The second survey resulted in a depiction of the MHTL that roughly corresponded to the toe of the emergency revetment, with portions being several feet seaward of the revetment toe and in some areas being overlain by segments of the revetment.



*The locations of the MHTL and existing easements for public lateral beach access at Broad Beach are important considerations that can affect both private property rights and public access along the coast. Applicant-prepared surveys indicate that the MHTL runs generally along or seaward of the revetment toe with limited areas under the revetment. CSLC surveys indicate that 0.86 acre of the revetment overlie public land and 34 lateral access easements. Lateral access along Broad Beach from the east can be impeded by high tides that often reach the toe of the revetment. Sand dunes and private lateral access exist in places inland of the revetment. On many parcels, existing Access and Recreational Easements for lateral access appear to be located beneath or landward of the existing revetment.*

CSLC also conducted a MHTL survey at Broad Beach on January 19-20, 2010, just prior to installation of the emergency revetment. The results of that survey identified a MHTL landward of the October 15, 2009 MHTL identified by the Applicant's engineers. An approximately 0.86 acre portion of the emergency revetment is located on public land according to the CSLC survey, while the Applicant's survey indicates a 0.12 acre encroachment on public land. Both the October 15, 2009, and January 19-20, 2010, surveys are depicted on relevant project figures (e.g., Figures 2-3 through 2-7).

In its review of this Project, the CSLC will consider all of the above information with regard to the location of the OHWM, its relationship to the Project and the Project's effects on public trust resources and values. To facilitate this decision-making process and permit the CSLC to consider all relevant data, this APTR provides a range of analyses based on available information.

### 2.1.4 Existing Vertical and Lateral Public Access

Public vertical access to Broad Beach is currently provided via two public access easements (Figures 1-1 and 2-2), which include pathways and stairs connecting to Broad Beach Road, as well as lateral access from Zuma Beach across Trancas Creek. Since construction of the emergency revetment in 2010, the two public vertical access points also include engineered stairways over the revetment to the beach. The two vertical access ways are owned and managed by the Los Angeles County Department of Beaches and Harbors, and are gated during the evening hours for public safety reasons as mandated by Los Angeles County. Unrestricted roadside parking is available along Broad Beach Road. Unlimited access during low to moderate tides is also available from Zuma Beach located immediately east of Broad Beach, with roadside parking available along the shoulder of Pacific Coast Highway and in the county-owned and operated public parking lot at Zuma Beach.



*Although the emergency revetment design accommodates public coastal access paths and concrete stairways across the revetment, the beach is accessible from these stairways during low to medium tides (left), while higher high tides combined with beach erosion impede access. On-street parking is available along Broad Beach Road. Note kelp deposited on lower railing (left) from last high tide.*

Existing public lateral access is currently available as a matter of right seaward of the OHWM on state-owned land, and landward of the MHTL on those private properties which have deeded such access, depending on seasonal sand levels and tides. However, under fall/winter conditions observed in 2011, even a moderate high tide of 3 to 4 feet may submerge all or most of the sandy beach, limiting both public and private lateral access along the shoreline. Under such conditions, the emergency revetment

presents a physical barrier to lateral access for beach goers as they try to dodge wave run up, as was similarly the case with the temporary sand-bag revetments. Under current conditions, it appears that coastal erosion has resulted in a materially diminished quality of sandy beach available for some recreation and public uses.

In addition to existing physical limitations, lateral access along Broad Beach is affected by a complicated mix of public land, easements for public lateral access, and private property. Land seaward of the OHWM is public. Further, over 50 of the private parcels along Broad Beach have granted scattered easements, deed restrictions, or other legal documents providing lateral public access. Collectively, these are referred to as Access and Recreational Use Easements (AREs) (Figures 2-3 through 2-6).

The *Public Access Action Plan (PAAP)* prepared by the CCC pursuant to direction and funding under former Governor Wilson's "Coastal Initiative" (CCC 1999)<sup>4</sup> identifies key issues that affect the public's ability to use and enjoy the coast for recreation. As a result, the CCC developed and implemented the Offer to Dedicate (OTD) Public Access Easement Program as a mitigation tool. Over the years, the CCC has required OTDs as mitigation of the individual and cumulative impacts of private development upon public access.

OTDs are recorded legal documents that represent a valid easement interest. However, OTDs are only offers of an easement; the interest belongs to the property owner until the offer is accepted by a government agency or a nonprofit organization. Once an OTD is accepted, the accepting entity obtains title to the easement. The easement then remains in the public domain in perpetuity; it cannot revert back to private ownership. Hereinafter, accepted OTDs or perfected lateral easement interests are referred to as AREs. These AREs vary in terms, but they typically extend 25 feet inland from above either the "daily high water line" or the MHTL; in some cases, AREs are restricted by buffers against the residential structures. Of the existing AREs along Broad Beach, the CSLC holds a total of 37, with 21 of its AREs partially or entirely covered by the emergency revetment, and that frequently extend landward of the revetment, as discussed further in Section 3.5, *Land Use, Recreation and Public Access*.

### 2.1.5 Existing Coastal Protection Structures

As discussed in Section 2.1.1 above, homeowners along Broad Beach have responded to threats of coastal erosion by installing a range of inconsistent emergency and long-term coastal protection structures. In addition to the 4,100-foot-long emergency rock revetment and the preceding emergency geotextile sandbag revetment(s) now located landward of the rock revetment, homeowners have installed a variety of coastal protection structures.

<sup>4</sup> California Coastal Commission, *Public Access Action Plan* (June 1999).

On the east end of Broad Beach, five existing homes, four undeveloped lots, and the Malibu West Beach Club are protected from coastal erosion by existing sand dunes and geotextile or sandbag revetments. Further west, one homeowner has elected to rely upon setbacks, sand dunes, and a geotextile revetment, leaving a 100-foot-long gap in the emergency revetment.<sup>5</sup> At the west end of the beach, 21 homes and two vacant beachfront parcels are protected by timber bulkheads, concrete seawalls, or rock revetments, or have been constructed on pilings.



Homes along Broad Beach, especially at Little Broad Beach at the west end of the Project area, have developed a variety of coastal protection structures constructed over many years.

## 2.2 PROPOSED PROJECT ACTION

The CSLC is considering the Broad Beach GHAD's lease application for beach nourishment and dune restoration; any portion of the existing emergency shoreline protective structure (revetment) located on State-owned lands would also need to be covered under a lease. The Project as proposed would implement a shoreline protection plan along Broad Beach, consisting of:

- 1) beach nourishment;
- 2) at least 20 years of dune restoration;
- 3) at least 20 years of smaller-scale sand "backpassing" (refer to Section 2.2.9) designed to prolong nourishment;
- 4) funding of one major future renourishment event in roughly 10 years; and
- 5) Authorization of the existing emergency rock revetment as a structure buried under both the beach nourishment and dune.

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<sup>5</sup> This property owner plans to seek permits to close the gap in the revetment with the same rock material that constitutes the existing revetment, but has not yet filed for permits.

As discussed further in Section 2.2.9, the GHAD is considering – but has not committed to – funding additional nourishment events after coastal erosion eliminates most or all of the coastal protection and beach access benefits of the proposed Project (i.e., which the GHAD estimates would occur in approximately 20 years). Other agencies, including the city of Malibu, the CCC, and others, also have or may have permit authority over elements of the Project (refer to Section 1.5, *Permits, Approvals and Regulatory Requirements*).

### 2.2.1 Physical Description of Proposed Project

As proposed, the Project would involve the following (refer to Figure 2-2 for project overview and Figures 2-3 through 2-6 for detailed project plans):

- Authorization of the existing emergency rock revetment;
- Dredging of fine-grained sand from offshore of Broad Beach and transport of sand via slurry pipeline onshore for placement within the boundaries of the restored dune area, burying the existing revetment;
- Dredging of beach-quality larger-grained sand from offshore of Dockweiler Beach (city of Los Angeles) and/or outside of Ventura Harbor; other borrow sites as approved by applicable agencies pending subsequent environmental review may also be considered, along with all required marine vessel transport to Broad Beach;
- Placement of coarse-grained sand obtained from an off-site (offshore) borrow site from the toe of the dune area to the seaward extent of the beach nourishment area;
- Transfer of the beach-quality sand from the marine vessels through a slurry pipeline onshore;
- Use of moveable slurry pipelines to allow for placement of dredged sand along various segments of the beach;
- Use of heavy equipment (e.g., scrapers, dozers) to distribute sand to desired locations and depth within the Project area;
- Development, construction, and maintenance of a backshore dune system intended to restore/replicate the historic dune structure and integrity at Broad Beach and be designated as protected Environmentally Sensitive Habitat Area (ESHA) consistent with the city of Malibu's Local Coastal Plan (LCP);
- Removal of non-native dune vegetation and replacement with native vegetation consistent with applicable CCC and city of Malibu standards for dune habitat restoration areas;

- Annual or biannual backpassing operations to move sand from wider reaches of Broad Beach to narrower reaches of the beach in accordance with objective “triggers” (refer to Section 2.2.9); and
- One major renourishment operation, projected to commence approximately 10 years after project initiation and in accordance with objective triggers.

After every major beach nourishment and sand backpassing event, the constructed beach would remain subject to ongoing natural wave and littoral transport processes and resulting redistribution of sand. As a result, initially constructed beach profiles would change until the constructed beach reaches an equilibrium consistent with ongoing coastal processes. Thus, while the discussion below precisely describes the initially engineered beach, the equilibrium of the beach would evolve as described via projections and modeling (refer to Section 2.2.7 and Section 3.1, *Coastal Processes*).

### **2.2.2 Long-Term Authorization of Existing Revetment**

As part of the long-term strategy for protection of homes and septic systems from coastal erosion, the Broad Beach GHAD seeks approval of the emergency rock revetment constructed in 2010, as temporarily permitted by the city of Malibu and the CCC, among others. If approved, the revetment would remain in place for the design life of the Project and would be buried beneath a new system of sand dunes located at the landward edge of the widened, nourished beach. The Applicant projects that the initial beach nourishment, periodic backpassing operations, and re-nourishment at approximately 10 years would keep this shore protection structure buried over approximately 20 years; however, severe beach erosion or other conditions could potentially reduce the time of burial substantially (refer to Section 3.1, *Coastal Processes*). The revetment would serve as a last line of defense against future severe erosion during extreme storm events.

The revetment was intended to be constructed primarily on private land, but overlaps public land in some areas. Portions of private land covered by the revetment are also encumbered by AREs that have been accepted and recorded by CSLC and various agencies for the benefit of the public to protect and provide for lateral access to the beach (refer to Figures 2-3 through 2-6). The Applicant proposes to move approximately 0.12 acre (838 square feet) of revetment that overlies public land, according to the October 15, 2009 survey, landward onto private property. However, according to CSLC’s January 19-20, 2010 survey, 0.86 acre of the revetment overlies and encroaches upon public land.

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**Figure 2-2. Project Overview and Key Components**

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**Figure 2-3. Details of Proposed Project – Western Reach**

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**Figure 2-4. Details of Proposed Project – West Central Reach**

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**Figure 2-5. Details of Proposed Project – East Central Reach**

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**Figure 2-6. Details of Proposed Project – Eastern Reach**

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Segments of the revetment that overlie existing AREs on private land would remain in place with lateral public beach access proposed to be accommodated on the new wide sandy beach. The Applicant proposes that these existing lateral access AREs and all currently existing lateral access easements be held in abeyance in accordance with project specifications and the maintenance of same for the life of the project. Such a proposal requires approval from CCC, CSLC, the city of Malibu, and all other agencies currently holding AREs at Broad Beach. CCC's PAAP states that the purpose of requiring a public access easement is to mitigate a project's specific impacts on the public access or to mitigate for the project's contribution to cumulative impacts of the new coastal development upon public access. The placement of a shoreline structure on a beach results in both a loss of recreational beach area and impedes lateral access. Therefore, the CCC often requires an OTD to help mitigate this public access impact by providing an alternate area that would permanently be available for use (CCC 1999).

### 2.2.3 Sand Sources

Three primary sand sources are currently being considered for the Project: one for fine-grained sand, and two for beach-quality coarser-grained sand (Figure 2-7). For details on dredging, sand transport, and delivery to Broad Beach, refer to Section 2.3, *Construction Procedures*. For the initial nourishment project, a total of 600,000 cy of sand would be dredged and placed at Broad Beach. Of this, 100,000 cy would be fine-grained sand dredged from Central Trancas offshore Broad Beach and placed as new sand dune habitat.<sup>6</sup> Approximately 500,000 cy would be dredged off Dockweiler Beach and placed for beach nourishment. An alternative source for coarse sand may be the sand trap just north of Ventura Harbor.

#### Sand Source for Dune Restoration

Dune sand would be dredged from an existing deposit of fine-grained sand located in a water depth range between 45 and 60 feet located approximately 0.25 mile offshore of the eastern segment of Broad Beach (Figure 2-7). This existing sediment deposit stretches for approximately 3.4 miles along the coast from Lechuza Point east to Point Dume and is roughly 1 mile wide. Dredging would be confined to a seafloor area of approximately 40 acres, located at a depth of between 45 and 65 feet below MLLW, which would be excavated to a maximum depth of 20 feet below the seafloor using a hopper dredge. The excavation area would be roughly a rectangular shape with side lengths of 2,000 feet and 500 feet.

<sup>6</sup> The Applicant has proposed another scenario where both dune and beach sand would be dredged from the Trancas sand source; this scenario is analyzed as an alternative in Section 4 *Alternatives*.



acres of restored dunes, 16 acres of beach berm and 17 acres of beach face. The height of the proposed sand dunes would be typical of the existing dunes at the east end of the project, which are approximately 20 feet higher than MLLW, which is the average low tide line during spring tides. The top of the existing emergency rock revetment would be buried beneath up to 8 feet of sand, and currently exposed foundations, seawalls, and pilings of homes on the west end of the beach would be covered or abutted by sand. Depending on location, the profile of the new dry sand beach berm would be roughly 12 to 17 feet above MLLW or existing winter low tide sand levels. The restored dunes would vary in width, with typical widths ranging from approximately 55 to 102 feet wide. The restored beach would also vary in width, with typical widths ranging from 104 to 286 feet wide. At its widest point, the combined new beach and dune system would extend approximately 286 feet seaward from the top of the existing revetment to the surf zone on the face of the beach berm (Figure 2-8).

For the purposes of dune and beach design, the project area was separated into three zones (A, B, and C) based on environmental sensitivity and geographical considerations (Figures 2-2, 2-3).

- Zone A measures 400 feet, from Lechuza Point to 31502 Victoria Point Road, at or near the home constructed on pilings over the beach. Zone A includes the majority of the area that supports environmentally sensitive rocky intertidal habitat, rocky outcrops, offshore reef and associated surf grass and kelp habitats.
- Zone B extends approximately 500 feet east of Zone A from 31500 Victoria Point Road to 31418 Broad Beach Road and includes the transition between the environmentally sensitive rocky habitat areas to less sensitive sandy beach and sandy intertidal areas.
- Zone C includes the majority of the project area and extends for approximately 5,000 feet east from 31412 Broad Beach Road to the east end of the site just upcoast of Trancas Creek, and supports less sensitive sandy beach and intertidal habitats.



*The proposed new sand dunes of 15 to 20 feet above MLLW (8 feet above the beach and represented by the yellow line) would completely cover existing pilings, seawalls, foundations and lower segments of stairways of homes at Broad Beach's west end.*

1  
2  
3  
4

**Figure 2-8. Cross Sections of Restored Beach and Dune Profile**

As described more fully below, Zone A was designed to have a higher beach berm and narrower beach footprint to be protective of sensitive intertidal and nearshore rocky habitat. Zone B was designed similar to Zone A, but with a slightly wider beach footprint due to less constrained conditions. Zone C is relatively unconstrained and is designed with the widest beach berm of the three areas.

The design of the beach nourishment was tailored to account for conditions within each reach; therefore, substantial variations in width, slope, and elevation occur across the reaches. The western 900 feet of the beach within Zones A and B, which represents approximately 15 percent of the total project length, would be designed as a moderately wide beach in an attempt to avoid sensitive rocky habitats with a combined dune and dry sand beach berm of approximately 130 to 160 feet wide and a steeper berm face constructed at a 3:1 slope (ratio of horizontal:vertical dimensions). The beach berm in this area would be 14 to 17 feet above MLLW. The dune area in Zones A and B would be approximately 55 to 65 feet wide from the seaward toe to existing homes and roughly 20 feet maximum above MLLW, with undulating crests and troughs, similar to existing dunes along the eastern reach. The remaining 5,000 feet of beach (Zone C) would broaden to a wide sandy beach with a combined dune and dry sand beach berm of approximately 195 feet wide and a gentle beach berm face constructed at a 10:1 slope extending seaward for an additional 70 feet to the new artificially created OHWM; the beach berm in this area would be 12 feet above MLLW. The dune area in Zone C would be roughly 85 to 90 feet wide from the seaward toe to approximately 10 feet beyond the landward extent of the revetment, with dune elevations of roughly 15 to 20 feet above existing MLLW to cover the existing revetment. The proposed dunes have been designed to replicate existing dunes at the eastern end and former dunes at the site by varying in footprint and shape. Dune concepts are provided in Figure 2-8, and nourishment dimensions for the different reaches are presented in Table 2-1.

**Table 2-1. Dimensions of the Post-Construction Restored Dune and Beach**

	Reach A	Reach B	Reach C
Typical Approximate Dune Width	55 to 65 feet	55 to 65 feet	85 to 90 feet
Maximum Dune Height (Landward)	20 feet above MLLW <sup>1</sup>	20 feet above MLLW <sup>2</sup>	20 feet above MLLW
Maximum Beach Berm Elevation	17 feet above MLLW	17 feet above MLLW	12 feet above MLLW
Typical Approximate Beach Width	105 feet	125 feet	265 feet
Constructed Beach Slope (horiz:vert)	3:1	3:1	10:1

<sup>1</sup> The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch, a 19-year period established by the National Oceanic and Atmospheric Administration that currently covers the period 1983-2001.

<sup>2</sup> Existing seawalls along this reach limit the landward extent of the dune.

In areas where constructed dunes would abut existing dunes on the landward side, the constructed dune would meet or exceed the elevation of the existing dune to protect existing dune habitat. In areas where a constructed dune abuts lower-lying non-dune private properties, the dune would slope landward for 10 to 20 feet in a 3:1 slope. In locations within the project area with no rock revetment, the constructed dune system would likely be lower and tapered to match requirements presented by each adjacent property (some of which have existing sea walls). As proposed, dune construction would be undulated along the beach in order to re-establish natural and historic dune topography, while preserving ground floor ocean views with low points in front of existing homes as appropriate and higher points along property boundaries.

### 2.2.5 Dune Habitat Restoration

The proposed dune restoration project includes measures to restore native coastal dune habitats through planting of appropriate native dune vegetation, potentially restoring all such areas to their current ESHA designations and protections consistent with the city of Malibu's LCP (Figure 2-9). Native habitat restoration would include planting species such as beach verbena, dune primrose and other characteristic species found in this community. The Applicant proposes that each property owner would select plant species from an approved list for the dune area fronting their property and would be responsible for maintenance of that area. A program of initial removal of non-native invasive species such as iceplant (Hottentot fig), pampas grass, myoporum, and European dune grass from areas within and adjacent to the restored dunes would be initiated by the GHAD.

**Figure 2-9. Conceptual Rendering of Dune Restoration**



Source: Moffatt & Nichol 2011

As proposed, signs would also be posted to demarcate sensitive dune habitats and private property (e.g., "Restricted Dune Habitat Area: Please Remain Seaward of Dunes on Sandy Beach") with the intent of creating a dune habitat restoration area and

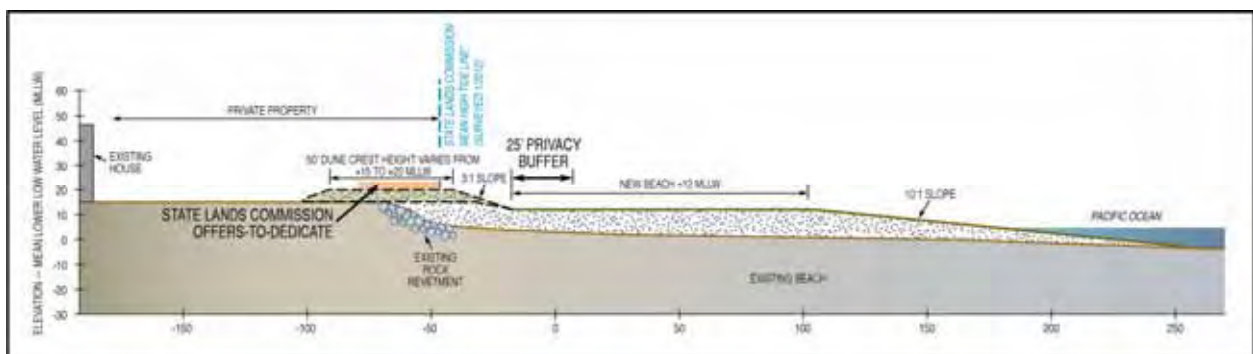
restricting public access on the restored dunes. However, private property owners would continue to be able to recreate at the seaward crest of the restored, ESHA designated dunes. Further, protocols would be implemented for long-term maintenance of restored habitats, including initial irrigation plans, ongoing invasive species/weed control and maintenance of signs and access control measures. Paths from the residences, the Malibu West Beach Club, and the County-owned vertical access points to the new beach would be included to guide access and protect newly established and restored dune habitat. The accessways would be bordered by low-profile access control features such as low posts connecting rope/cable barriers to discourage deviation from the paths in order to preserve the ESHA created by the restored dune system. The Applicant proposes to construct one such vertical access path for each residence along Broad Beach, for a total of up to 114 private walkways crossing the 6,000 feet of restored dune habitat.

### 2.2.6 Private Property and Public Lateral Access

As discussed above, public lateral access along Broad Beach is currently limited to times of low and moderate tides. Public access landward of the MHTL is also affected by uneven distribution of AREs for lateral access which are recorded on approximately half of the private parcels along Broad Beach. These AREs typically extend inland on private property 25 feet above the daily high water line or the MHTL; however, in many areas the existing revetment now overlies these AREs and thereby impedes the public access intended by the ARE.

Under the proposed Project, all homeowners in the GHAD would provide for uniform, dedicated lateral access over the entirety of the restored dry-sand beach. The Applicant proposes that this dedicated lateral access would encompass the new beach seaward from a proposed 25-foot privacy buffer mostly on public lands which would extend seaward from the toe of the restored dune (Figures 2-3 through 2-5, 2-10).

**Figure 2-10. Cross Section of Restored Dune and Beach With Existing Offers to Dedicate and Proposed Public Access Easements**



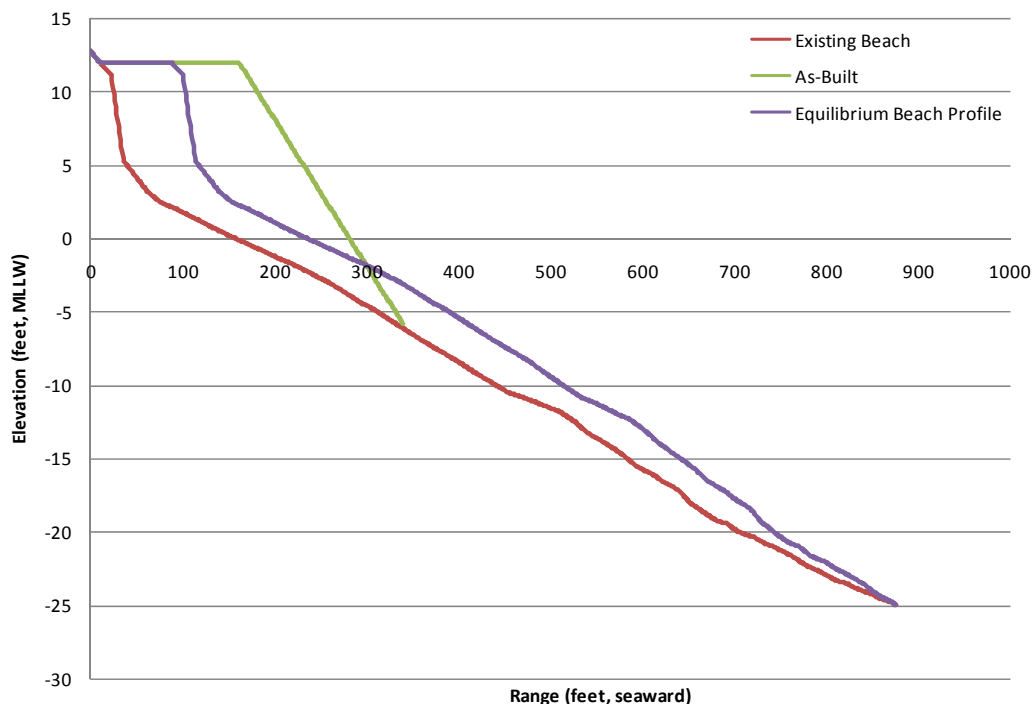
Under the Project, the public would be allowed to use this privacy buffer to pass and repass if the beach is otherwise impassable due to high tides or coastal erosion. In many areas, this proposed privacy buffer would overlies existing public lands or easements, requiring a lease or grant of public lands for such purposes. The legality and desirability of this proposed access restriction would be considered by all permitting agencies and defined through a formal agreement between the GHAD or TPOA and relevant agencies such as the CCC and California Department of Fish and Game (CDFG).

### 2.2.7 Post-Nourishment Beach Equilibrium

For a beach nourishment project, sand is initially placed high on the upper portion of the beach profile above the mean lower low tide area. This is done to expand the level beach berm area for immediate benefit, to retain the sand for as long as possible, and to facilitate construction. The constructed beach immediately undergoes reworking by waves and tides that distribute the sand both offshore and alongshore. As sand redistributes, the nourishment project will experience a process of equilibration to a more natural condition of berm width and profile slope that depends on sand grain size and wave energy (the “equilibrium beach profile”).

The equilibrium beach profile was estimated using several different methods. Essentially, approximately one-third of the width of the beach berm would be lost within approximately one season after construction, and the slope of the beach would flatten as a result (Figure 2-11).

**Figure 2-11. Example of Equilibrium Beach Profile**



### 2.2.8 Long-Term Beach Profile Monitoring

In order to determine the performance of the nourishment project and monitor the effect of coastal erosion on sand loss on the beach, the Applicant would perform long-term beach profile monitoring. The goal of this monitoring would be to identify and assess coastal erosion and the potential need to initiate backpassing or a major renourishment episode to offset such erosion. This monitoring would include:

- 1) Measurement points: Monthly measurement of the dry sand beach width (similar to what is performed at Zuma Beach) from the seaward toe of the restored sand dune system to the seaward edge of dry sand "towel area" at five measurement point profiles specified below and shown in Figure 2-12.

**Figure 2-12. Profile Locations for Monthly Beach width Measurements**



- a) 408 (east end – 30756 Broad Beach Road)
- b) 409 (east-central reach – 30916 Broad Beach Road)
- c) 410 (central reach – 31108 Broad Beach Road)
- d) 411 (west-central reach – 31324 Broad Beach Road)
- e) 412 (west end – 31506/31504 Victoria Point Road)

- 2) Semi-annual (spring and fall) full beach profile measurements out to the closure depth (approximate ocean water depth of 40 feet).

3) Estimation of the rate and trend of beach width change and sand volume change at each of the measurement points for 1 year prior to construction and regularly after construction for 10 years.

Based upon these measurements, the Applicant would initiate either annual or biannual backpassing of sand from the wide reach of beach to the narrow reach of beach or in approximately 10 years from completion of the single major renourishment event. Objective and qualitative beach width monitoring triggers for initiation of these actions are discussed below.

### 2.2.9 Future Beach Management Events

Based on information garnered from the beach profile monitoring program, the Applicant has established certain objective triggers for initiation of beach management actions. The goal of these triggers would be to identify when beach erosion is reaching a point that threatens project benefits (e.g., protection of private property, lateral access, recreation, dune restoration, etc.) and to permit sufficient time to implement management actions to maintain these benefits. Management actions would include short-term backpassing events meant to prolong the life of the beach renourishment activity.

#### Backpassing

Backpassing would involve the use of heavy equipment (e.g., scrapers, bulldozers) to excavate sand from the downdrift “sand rich” segment of Broad Beach (anticipated to be the eastern reach) and the transport of that sand to the eroding reach of Broad Beach (anticipated to be the western reach). Backpassing is proposed to extend the practical lifetime of this beach nourishment project by recycling sand back updrift within the littoral cell and delay the need for major beach renourishment. It is anticipated that backpassing will occur on an annual or biannual basis for 20 years, potentially resulting in anywhere from 20 to 40 backpassing events over the life of the project as currently proposed by the Applicant.



*Sand backpassing operations such as this one in Long Beach typically involve the use of bulldozers and scrapers to excavate sand from wider downdrift areas for movement updrift to narrow eroded beaches. Backpassing at Broad Beach would likely occur in alternate years and involve movement of approximately 25,000 cy of sand from the beach's east end to its west end.*

Backpassing is less expensive than small-scale nourishment from either onshore sources via trucking due to high unit cost or from offshore dredging due to equipment mobilization costs.

#### Backpassing Triggers

The purpose of the backpassing triggers is to maintain a balanced benefit of the beach nourishment and to help keep the revetment buried. The triggers are meant to be used in combination with on-site observations and an understanding of historical and projected future trends. Conditions would be monitored frequently due to the large variability in potential shoreline change rates in order to determine whether triggers are approaching or met.

The Applicant has identified a general trigger to begin backpassing operations as well as more specific triggers related to the eastern and western ends of the beach.<sup>7</sup>

Backpassing triggers are initiated when:

- Any reach of the beach becomes narrower than required for public access, shore protection, and recreation, while other reaches of the beach are concurrently widening and/or holding sufficiently greater volume of sand than the narrowing reach.
- For conditions when the west end of the nourished beach is in deficit, the point in time when the western average is 50 feet or less for 6 consecutive months and the eastern average is at least 25 feet wider than the western average over the same period of time.<sup>8</sup>
- For conditions when the east end of the nourished beach is in deficit, the point in time when the eastern average is 50 feet or less for 6 consecutive months and the western average is at least 25 feet wider than the eastern average over the same period of time.

Since the natural direction of sand movement (littoral drift) is to the east, it is anticipated that the predominant backpassing operation will be from east (surplus) to west (deficit). Backpassing sand from west to east may result in more rapid loss of sand from Broad Beach toward the east if conditions of eastward sand transport predominate over time.

<sup>7</sup> The eastern reach sand source location extends from 31108 Broad Beach Road to the east end of the GHAD (the eastern half), while the western reach sand source location extends from 31108 Broad Beach Road to the west end of the GHAD (the western half).

<sup>8</sup> For this Project, "western average" means the width of the dry sand beach measured from the seaward toe of the restored dune to the mean high tide line at profiles 411 and 412; "eastern average" means the width of the dry sand beach measured from the seaward toe of the restored dune to the mean high tide line at profile points 408 and 409.

1 The resulting action would be to backpass using mechanical equipment (scrapers and  
2 bulldozers) from the wide reach of beach (surplus area) to widen the narrow reach  
3 (deficit area) of beach by between 25 and 50 feet (depending on available volume).  
4 Surplus sand to be backpassed shall be scraped from the wetted portion of the beach  
5 seaward of the apparent mean high tide line (wetted bound) (refer to Figure 2-11).<sup>9</sup>

### 6 *Public Access During Backpassing*

7 At least 1 week prior to backpassing operations, signs notifying the public of the dates  
8 of backpassing operations would be posted at the public access points and at other  
9 highly visible locations along the beach. To the extent possible, public lateral access  
10 across the beach would be maintained during backpassing operations by  
11 implementation of a construction vehicle traffic management plan. During backpassing  
12 operations, the responsible contractor would station a flagman at each access point to  
13 control construction traffic and pedestrian foot-traffic. The majority of the working area  
14 below MHHW would be closed to the public during the operation. People would be able  
15 to use the beach above MHHW, and be able to traverse the beach to the water at the  
16 public access points using the flagmen. This process may take up to 2 weeks and would  
17 occur in fall and/or spring months, avoiding summer.

### 18 *Periodic Renourishment*

19 Assuming that current sand loss rates in the Broad Beach area average about 35,000  
20 cy per year as reported, the Project includes periodic renourishment. This is anticipated  
21 to involve dredging and placement of an additional 450,000 cy on the beach area in  
22 approximately 10 years, similar to the original nourishment event. This would be smaller  
23 than the initial nourishment event as it is presumed that the 100,000 cy of sand in the  
24 new dune system would remain intact and a certain amount of sand would remain on  
25 the beach. The actual timing for when renourishment would occur is unknown and  
26 would be determined via monitoring, as described below.

27 The Applicant has also proposed the option, at the Applicant's discretion, of providing  
28 additional nourishment events after the initial project term of 20 years provided that  
29 subsequent nourishment events shall be not less than 50 percent of the first major  
30 nourishment event, or approximately 300,000 cy. However, because the Applicant has  
31 not committed to such future nourishment, this conceptual proposal is not considered in  
32 this APTR.

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<sup>9</sup> Beach monitoring station 412 is located at approximately 31504 Victoria Point Road (west of the home constructed on pilings).

### *Renourishment Triggers*

The trigger to begin a major renourishment event would be the point in time when insufficient sand is available for backpassing in the fall season, as indicated when:

- The west end of the nourished beach is in deficit (i.e., the point in time when the western average is 50 feet or less for 12 consecutive months) and the eastern average is less than 25 feet wider over the same period of time; and
- The east end of the nourished beach is in deficit (i.e., the point in time when the eastern average is 50 feet or less for 12 consecutive months) and the western average is less than 25 feet wider over the same period of time.

The Applicant has proposed that this trigger will only apply if at least 10 years have passed since the initial nourishment. When this trigger is reached, sand would be dredged from an approved offshore sand borrow site; no less than approximately 500,000 cy of sand in the second renourishment episode and no less than approximately 300,000 cy in subsequent renourishment episodes, would be deposited on Broad Beach within 12 months. The sand source for these renourishments would be the same as for the initial nourishment, unless applicable agencies approve other borrow sites, and in which case all details of construction described below would still apply.

### *Public Access During Renourishment*

Public access during renourishment activities would be maintained to the maximum extent possible. At least 2 weeks prior to commencing nourishment operations, signs notifying the public of the scheduled dates of nourishment operations would be posted at the public access points and at other highly visible locations along the beach. To the extent possible, public lateral access across the beach would be maintained during nourishment operations by implementation of a construction vehicle traffic management plan. It is estimated that renourishment would require only 500 feet of the beach at any one time, and the remainder of the beach could remain open for public use. The areas of active work (e.g., the training dikes, areas where earthmoving equipment is being used) would be clearly delineated and access would be controlled by contractors to ensure safety of beachgoers as well as those involved in the renourishment activities.

## **2.3 CONSTRUCTION PROCEDURES**

Construction for the Project would involve the following sequence of events – some of the tasks may occur concurrently:

- Dredging the offshore borrow sites with either a clamshell dredge, hopper dredge, or cutterhead suction dredge;

- Transporting the sand via hopper or scow to Broad Beach and pumping sand through floating/submerged discharge lines to the beach (involving booster pumps, as necessary);
- Double-handling of sand if the Ventura Harbor dredging operation requires scows to dump sand offshore of Broad Beach, followed by pumping sand to shore;
- Discharging the sand at Broad Beach within training dikes;
- Redistributing the sand as needed with earthmoving equipment (e.g., bulldozers) and grading the beach fills to required dimensions; and
- Backpassing the sand from the wide reach of the beach to the narrow reach annually or biannually using heavy equipment such as scrapers and bulldozers.



*Dredge pipelines and other materials and equipment would possibly be staged on a 5-acre section of beach adjacent to Zuma Beach parking lot.*

### 2.3.1 Initial Project Construction Schedule

Major renourishment construction activity is estimated to extend over a period of 6 months. The current schedule is for December through May 2013 for dredging, and May 2013 for completing detailed elements of the dunes. Dredging would occur throughout the first 5 to 6 months, with beach sand being dredged from Dockweiler Beach and/or Ventura Harbor from December 1 to May 10, and dune sand being dredged from offshore Broad Beach from May 1 to May 31. Dune building, including deposition of sand and movement of the sand into the correct location and dimensions, would require approximately 30 days, while beach building would require 180 days. Planting, fencing, signage, and placement of temporary irrigation systems (refer to Section 2.3.4, *Construction Details*) within the dunes would require another 30 days, extending into summer 2013. Most activities (earthmoving and dune planting) within the Project area would occur between 7 AM and 7 PM; however, pumping of dredged sand into the dune and onto the beach would occur 24 hours per day and 7 days per week during this phase.

### 2.3.2 Construction Staging Area and Equipment

During the construction phase of the Project, construction equipment and materials would be staged within an approximately 0.25-acre area at the west end of the parking lot at Zuma Beach County Park (Figure 2-13). Additional temporary staging areas for dredge pipelines and other miscellaneous equipment (not vehicles) may also be established on the beach immediately adjacent to the Zuma Beach parking lot, between

**Figure 2-13. Construction Staging for the Proposed Project**



the parking lot and Trancas Creek (Figure 2-13). Construction vehicles and equipment would access the site via Pacific Coast Highway into the Zuma Beach parking lot. From the parking lot, equipment would travel down to the wet sand beach and along the beach in front of Trancas Creek and onto Broad Beach. The personnel requirements for the project would include 12 workers during daytime construction hours (7 AM to 7 PM), with one to three employees supervising deposition of dredged sand within the training dikes through the night. Equipment anticipated to be necessary for construction activities associated with the Project is summarized in Table 2-2.

**Table 2-2. Preliminary List of Construction Equipment for the Broad Beach Restoration Project**

Onshore Support Equipment	Onshore Vehicles	Marine Equipment
Contractor's mobile office (1)	Crane (1)	Cutterhead suction dredge
Generators (estimated 2)	Bulldozers (2)	Hopper dredge
Portable restrooms (3)	Fuel truck (1, not stationed at site)	Booster pumps (1 to 2)
Lighting for dredge pipeline output	Delivery trucks (estimated 10)	Pipelines and buoys

Fuel trucks would travel to the staging area at the Zuma Beach parking lot every morning to fuel Project equipment. The typical amount of fuel dispensed during each fueling visit would be approximately 200 gallons, which would fill the tank of two typical bulldozers). Service trucks providing lubricant and oils for Project equipment would visit the staging area weekly for maintenance. All fueling and/or maintenance of project equipment would be restricted to the Zuma Beach parking lot and staging area. Disturbed areas of the parking lot would be repaved as needed after project completion.

### 2.3.3 Best Management Practices

Best Management Practices (BMPs) would be implemented throughout the construction phase of the Project. As the proponent, the GHAD or its contractors would implement site-specific construction mitigation plans, including a traffic minimization plan and equipment refueling plan.

### 2.3.4 Construction Details

Beach replenishment operations would include the use of dredge vessels to dredge sediment from the offshore borrow sites (Figures 2-14, 2-15, and 2-16) and transfer the sediment to the proposed receiver site (Table 2-3, Figure 2-8). The contractor may use one or more of several different dredges and transport vessels depending on the chosen sand source and equipment availability, as presented below.

**Table 2-3. Summary of Dredge Operations**

<i>Dredges</i>	One or two dredges
<i>Support Vessels</i>	One crew boat, one tug boat
<i>Duration of Dredging</i>	6 months, preliminary schedule December 2012 – May 2013
<i>Support Vessel Trips</i>	Every 8 hours for a crew change, launched from Malibu Pier, Channel Islands Harbor, or Marina del Rey
<i>Location of Moorings</i>	1,250 feet offshore Broad Beach
<i>Pipeline Route</i>	Straight to shore from monobuoy, submerged along most length and floating through surfzone
<i>Booster Pumps</i>	As many as two – one offshore on the barge and one if needed near the east end of Broad Beach.
<i>Vessel Safety Plan</i>	To be prepared by dredge contractor prior to commencing operations





## 1 Potential Dredge Options

2 Clamshell dredge: This type of dredge could  
 3 potentially be used to obtain sand from the  
 4 Ventura Harbor site. Barge clamshell dredges are  
 5 not self-propelled and would therefore need a  
 6 small tugboat to maneuver within the channel.  
 7 From a barge, the operation would begin when the  
 8 bucket assembly, attached by a long arm (up to  
 9 100 feet) is lowered, in the open position, into the  
 10 water and allowed to settle into the seafloor to  
 11 collect sediments. As the dredge operator pulls the  
 12 bucket up it closes on the sediment, pulling out up  
 13 to 5 cy of water-sediment mix. The dredge  
 14 operator can then deposit the water-sediment mix onto a scow (see below). The  
 15 clamshell dredging method can be more efficient than hydraulic methods like cutterhead  
 16 suction dredging, as the amount of water in the sediment mix is substantially lower –  
 17 this reduces the number of trips required to obtain a given amount of sand. However, it  
 18 can cause greater temporary turbidity and sedimentation issues at the dredge site,



A clamshell dredge could potentially be used to obtain sand from the Ventura Harbor site, minimizing the amount of water in the sediment load.

since the disturbed and suspended sediment in the water column is not sucked into a tube as in the hydraulic methods. It is possible to reduce turbidity generated by this method through the implementation of dredging practices such as lowering and raising the clamshell bucket slowly, or using a closed bucket.

Cutterhead suction dredge: This type of dredge could potentially be used to obtain the fine-grained sand from the Trancas deposit offshore of Broad Beach. In the event that sand is delivered to offshore Broad Beach from a scow (see below), this dredge could also be used to transfer that sand to the beach. A cutterhead suction dredge is not a self-propelled vessel and it uses a long arm that extends down to the sea floor to dredge sediment. A rotating head about 8 feet in diameter sweeps an area approximately 300 feet wide. However, a cutterhead dredge breaks up sediment material along the seafloor, then uses a vacuum mechanism to suck sediment into an intake line



*A cutterhead suction dredge (a cutter head is shown here) would potentially be used to obtain fine-grained sand from the Trancas deposit and beach-quality sand from the Ventura Harbor site.*

and pump it directly to shore through a discharge line. For the fine-grained sand at Trancas, the cutterhead dredge would anchor above the borrow site while its arm swings back and forth to dredge up sediment. It would then pump a mixture of sediment and sea water through a floating discharge line directly onto Broad Beach. The discharge line would be assembled afloat, connected to the cutterhead suction dredge, and pulled to land by tugboats, or assembled on land and dragged offshore to the dredge by tugboat. Unlike the hopper dredge, the cutterhead dredge would remain off of Broad Beach at the dredge site for the entire operation while pipelines carry the material. If the cutterhead suction dredge were used at the Ventura Harbor site for coarse-grained sand, it would pump the dredged sand into a scow for transport to Broad Beach. This type of dredge would not require connection to a monobuoy to transfer sand to Broad Beach (see below).

Hopper dredge: This type of dredge would be used to obtain beach-quality sand from the Dockweiler site if that site is chosen. In that case it would also be used to obtain the fine-grained sand from the Trancas deposit. The hopper dredge is a self-propelled vessel that loads sediment from an offshore borrow site, then moves to a receiver site for sand placement. The hopper dredge contains one or two large drag-arms that move along the ocean floor and collect sediment. The drag heads are about 10 feet



*A hopper dredge could potentially be used at both the Dockweiler site for beach-quality sand and at the Trancas deposit for dune sand.*

square. The hopper dredge moves along the ocean surface with its arms extended, making passes back and forth until its hull is fully loaded with sediment. The vessel can hold approximately 2,000 to 5,000 cy of sediment per load, depending on which vessel is selected. The hopper dredge has the ability to dump the collected sediment out the bottom of the hull, or it can be pumped out.

### *Potential Transport Vessel Options*

Scow: If the Ventura Harbor site is used for coarse-grained beach-quality sand, the clamshell dredge or cutterhead suction dredge would fill a scow, which would be towed by a tugboat down-coast to the Broad Beach site. Scows are simply open-topped barges, some of which have hinged bottoms to allow for rapid dumping of material to the seafloor. Typical volumes for a scow are 2,000 to 4,000 cy.



A scow would be used to haul dredged sand to Broad Beach if the Ventura Harbor site were chosen, and would either dump sand on the seafloor for transfer or pump through a slurry pipeline directly to shore.

Hopper dredge: If the Dockweiler sand source is chosen and the hopper dredge is used to obtain the sand, the dredge would travel up-coast under its own power to the Broad Beach site. Refer to the description of the hopper dredge above for a description of the vessel.

Regardless of the dredge or transport vessel type, the U.S. Coast Guard (USCG) would post a *Notice to Mariners* with the coordinates of dredging activity so that ocean users can avoid the activity. For both types of dredge vessel, discharge lines would have to be placed in the ocean offshore of Broad Beach and potentially off of Ventura Harbor if a cutterhead suction dredge is employed to load scows at that location. Some portions of these lines would be floating. The floating portion of the dredge discharge line would be marked and lighted for navigation safety and identified in the *Notice to Mariners*. The discharge line would be trucked or floated in segments to the appropriate placement locations and assembled using cranes and other equipment. The discharge line may be a combination of plastic high density polyethylene (HDPE) and steel materials, depending on need and availability, and would be approximately 30 inches in diameter. Submerged portions of the line are weighted with collars and rest on the seafloor.

### *Monobuoy*

If sand is pumped directly to the beach from a hopper dredge or scow, these vessels would connect to a proposed monobuoy and pipeline. The monobuoy is a floating platform that would be used to interconnect a floating pump line with a steel sinker pipeline placed on the seafloor that would run the 1,250 feet distance to the beach. As

the pipeline approaches the shoreline, it would float on the surface for approximately 500 feet. The monobuoy would be anchored in at least 40 feet of water, in a location to avoid sensitive resources such as kelp, reefs, and structures such as outfalls. An anchor plan would be prepared for each monobuoy for submittal to the resource agencies prior to construction that illustrates the relationship between anchors on the ocean floor and identifies any sensitive resources in the vicinity. No lighting would be placed on the dredge pipeline because it is on the seafloor. Where it meets with the monobuoy, it would be lit with navigation lighting.

### *Dredge Discharge Pipeline to Beach*

The dredge discharge line would either be floating or placed on the beach. During the operation, floating pipeline segments would be subject to weather and wave conditions. If substantial wave action is anticipated, any floating pipe would be temporarily dismantled until suitable wave conditions returned. The pipeline could then be temporarily staged along the beach and reconstructed once wave conditions allow. Coordination with the USCG would be a critical component of floating pipeline placement. Onshore pipeline segments would be placed along the toe of the revetment. The discharge line would be placed on top of the existing sand or cobbles and be buried at intervals to provide for pipe anchoring and for beach access to the public. Areas of active construction (e.g., training dikes; or where sand is redistributed by earthmoving equipment) would be cordoned off from the public with signs and may extend up to 1,000 feet in length at any point in time. The area closed to beach use during construction would progressively move along the beach with the dredge discharge point, so all other beach areas would be accessible during construction. Construction crews would also be on-site to monitor the construction site to prohibit public access. All other areas of the discharge line would be open to public use. Maintenance of the discharge line would occur as necessary. The line may be affected by waves and tides and may periodically require added support, protection, or relocation. Earthmoving equipment and cranes may be used to maintain onshore portions of pipeline. More frequent line maintenance than typical may be required for the onshore line at Broad Beach as little room exists for line placement and protection at this site.



*Offshore dredge pipelines would come straight ashore through the surf zone and would be exposed to wave action.*

### *Support Vessels*

A crewboat would exchange work crews at the dredge site three times per day, and tend the discharge line connection to the monobuoy at the same frequency. The

1 crewboat route would likely be from Malibu Pier, Marina Del Rey, or Channel Islands  
2 Harbor to the site; its movements would be tracked with GPS during construction. Tug  
3 boats may also be employed to move dredge lines and support dredge and scow  
4 operations.

### 5 *Placement of Dredged Materials*

6 Training dikes would be constructed to  
7 reduce turbidity and aid in the retention  
8 of pumped sand at receiving beaches.  
9 The material coming from the dredge  
10 material discharge pipeline would be a  
11 slurry mix of sand and water. Once the  
12 water flowed back to the ocean, the  
13 heavier sand would settle onto the  
14 beach. The training dike system would  
15 consist of two dikes—one that is  
16 perpendicular to the beach connected  
17 to one that is parallel to the beach,  
18 forming an “L” with the long end  
19 parallel to shore. The dikes would be  
20 constructed using two bulldozers. Sand  
21 would be placed at a single discharge  
22 point behind (i.e., landward of) the  
23 dikes. The dikes would be used to direct the flow of the discharge and slow the velocity  
24 of the slurry effluent, thereby allowing more sediment to settle onto the beach instead of  
25 remaining in suspension and being transported back into the surf zone. Given how little  
26 sand currently exists at the Broad Beach site, an initial quantity of sand would need to  
27 be discharged on the highest portion of the beach at low tide before training dikes could  
28 be constructed.



*Dredged sand would be pumped onto the beach within training dikes, in order to capture sand and minimize the amount of turbidity in coastal waters.*

29 During night operations, shielded lights would be placed on the beach directed at the  
30 dredge pipeline discharge point, and would be powered by a generator.

### 31 *Beach Building*

32 Beaches would be formed by deposition of sand from the dredge discharge line within  
33 the training dikes. Sand would be graded and spread along the beach to the dimensions  
34 of the beach fill plan using two bulldozers. The dozers and one crane may be used to  
35 progressively move the discharge pipeline along the beach as the fill is placed and the  
36 beach fill is lengthened.

### *Dune Building and Restoration*

The dune would most likely be formed by deposition of sand from the dredge discharge line within a raised and diked containment system. Sand would be graded and spread over the existing revetment on the east and up against existing foundations and seawalls in the west to an approximately 55- to 102-foot-wide dune field of 15 to 20 feet in height using smaller bulldozers. A dozer and one crane may be used to progressively move the discharge pipeline along the dune as the fill is placed and the dune is lengthened. Following sand placement and planting of approved native dune flora, private access to the area would be channeled on approved pathways to ensure protection of the nascent dune habitat (refer to Section 2.2.9 for details on access restrictions).

### *Storm Water Management*

Storm water drains currently terminate in a variety of locations within the primary Project area. Although poorly documented, some of the drains are located behind the revetment, some extend through the revetment, and at least one large box culvert is located adjacent to the foundation of a home in the western reach of the Project area. The Applicant has proposed three potential ways to address storm water drainage across the dunes and beach: 1) sand placement around existing storm drain outlets; 2) extension of existing drains through the dune and beach into the surf zone; and 3) extension of drains only to the toe of the dune, with drainage occurring onto the beach.

### *Public Access During Construction*

Public access during nourishment and dune restoration activities would be maintained to the maximum extent possible. At least 2 weeks prior to commencing nourishment operations, signs notifying the public of the dates of nourishment operations would be posted at the public access points and at other highly visible locations along the beach. To the extent possible, public lateral access across the beach would be maintained during nourishment operations by implementation of a construction vehicle traffic management plan. It is estimated that nourishment and dune restoration would require only 500 feet of the beach at any one time, and the remainder of the beach could remain open for public use. The areas of active work (e.g., the training dikes, areas where earthmoving equipment is being used) would be clearly delineated and access controlled by contractors.

### *Backpassing*

The Applicant estimates that backpassing would be performed either annually or biannually, and would occur when the triggers noted above in Section 2.2.9 are reached. Each backpassing operation would require approximately 2 weeks to

complete, and would include five personnel, one bulldozer, three scrapers, and a supervisor/foreman vehicle. Standard earthmoving BMPs would be used to reduce impacts from these operations.

The quantity of sand to be periodically backpassed as part of the project would be approximately between 50,000 to 100,000 cy per backpass event. This would “replace” or move back up coast the 70,000+ cy of sand estimated to be lost from Broad Beach every 2 years (more rapid sand loss is anticipated immediately after nourishment, so this number will increase). The proposed sand borrow site for backpassing would be located at the wide reach of Broad Beach (anticipated to be the east end), within an area extending alongshore for approximately 2,000 feet. When beach erosion triggers are met, backpassing operations would be conducted using heavy equipment to move sand from between the wider borrow area to the deposition area (anticipated to be at the beach's west end).

The proposed borrow site is projected to be approximately 10 acres in size and would be located on the sloping wetted beach slope at the wide reach of Broad Beach; it would not extend into the sand dunes or into the intertidal zone. Excavation at the proposed borrow site would entail a 5-foot thick cut from existing top of slope (the top of slope is 12 feet above MLLW) to approximately 0 feet MLLW. The proposed fill site would be about 2,000 feet in length and be an estimated 100 feet wide and match the existing top of slope (12 feet above MLLW) and extend to approximately +3 feet MLLW.

The contractor would establish a haul route along the seaward edge of the beach, maximizing the distance between the work and residences. The contractor would establish fencing or signs to control public access to the work site. Access points through the work zone would be continuously manned by construction monitors. Sand backpassing implementation is expected to commence in October of each year when the objective triggers are met and is estimated to occur over a 2-week (10 working day) period. The equipment would typically operate on a 12-hour basis between 7 AM to 7 PM, and approximately 5,000 cy per day would be moved.

The Applicant would use the west end of Zuma Beach's parking lot for a staging area for backpassing operations, as described for beach nourishment (refer to Figure 2-14). Up to 0.25 acre would be required. Ingress and egress for the construction equipment to the staging area would be via existing driveways off of Pacific Coast Highway; access to the beach would be via the existing ramp at the parking lot's west end. The staging area will accommodate construction, materials, parking of support vehicles, and assembly of construction crews. The site would be fenced off and equipment will be stored overnight. This site has been used previously for the emergency rock revetment project.